ronmental characteristics, the current through it may be determined by measuring the voltage across it, as performed by differential amplifier **1404**.

Furthermore, it is possible to obtain resistance measurements for the outer planes **102** and **103**, as this same current is now flowing entirely across both these planes. The voltage developed across connections **107** and **108**, under these conditions, is the maximum voltage that can be generated from this plane **102** as a result of mechanical interactions. The minimum voltage is always zero. Thus, during calibration, the voltage measured by amplifier **1403** determines a scaling factor to be used whenever the position of a mechanical interaction is determined with respect to the top plane **102**. Similarly, the lower plane **103** may be calibrated in this way, with the full range being defined by a minimum of zero volts, to a maximum defined by the voltage measured across connections **111** and **112** during calibration. This provides highly accurate calibration data, that may be used to determine position measurements with a high degree of accuracy, and with a highly simplified and low cost circuit.

In an alternative embodiment, the calibration resistor **1451** is excluded, and simply replaced by a link. Thus, when switch **1408** is conducting, current flows directly from connection **108** to connection **112**. The voltages developed across planes **107** and **108** are unaffected by this modification.

The absolute value of the constant current generated by the constant current source itself is not required as a measurement. It is the ratio of the current through the calibration resistor **1451**, to the voltages that are measured during sensor operation, that enables environmental factors and manufacturing variations to be counteracted. Since the current is determined by measuring the voltage across the calibration resistor, this calibration voltage is all that is required in subsequent calculations to determine the characteristics of mechanical interactions. The constant current emitted by the current source **1401** itself, need only fall within bounds of viable circuit operation, and thus a reasonable manufacturing variation in this value may be accounted for by use of this type of circuit. Typically, x position may be calculated using the measured reading for the position with the calibration resistor switched out divided by the last calibration reading representing maximum x. Y position may be calculated in a similar way. Similarly z reading related to force and area may be calculated using the measured reading for Rv, or the contact resistance, divided by the last available reading of voltage across the calibration resistor.

The micro-controller may perform a calibration cycle periodically, for example, once every second, depending on how quickly the environment is expected to change. In some applications, calibration need only be performed once when the system is powered up, and perhaps once every hour or day thereafter.

Alternatively, the micro-controller may cause the circuit to remain in calibration mode, and to monitor the voltage across the calibration resistor continuously. A sharp change in voltage indicates that a non-environmental change has occurred, due probably to conduction of the sensor via its central layer **104**. When a sharp change of this kind is observed, the micro-controller ends calibration, and performs position measurements as described above. The calibration value used is the same value as was observed continuously prior to the sharp change. Signal processing methods may be applied both to determine the relatively constant calibration voltage across the resistor **1451**, and to determine a rate of change indicative of sensor activation. For example, a kalman filter may be used to determine the steady state calibration voltage, and comparisons between the output from the kalman filter and the instantaneous voltage across the resistor **1451** may be used to determine whether or not the sensor has been activated. Once the sensor is no longer conducting, calibration may be selected again.

In an alternative embodiment, the circuit of FIG. **14** is modified to include additional CMOS switches controlled by the micro-controller **1402**, such that the connections **107** and **108** are swapped, and connections **111** and **112** are swapped. After these connections have been swapped, current flows through the previously non-current carrying regions of the sensor planes **102** and **103**. Measurements made in this way, with the calibration circuit switched off, may be combined with measurements made in the unswapped condition, in order to improve the overall accuracy of measurements.

The multiplexer circuit **1407** is a generic CMOS **4053** integrated circuit. The micro-controller **1402** is an 80C51, manufactured by Phillips. However, in an alternative embodiment, a PIC type micro-controller may be used, as manufactured by Microchip. A part may be used that includes the A-D converter **1406**, thereby reducing the unit cost of high volume manufacture. The micro-controller communicates with a computer **132** shown in FIG. **1** via a serial connection **131**, or other information receiving device, to which measurements are to be supplied.

The combined sensor shown in FIG. **11** may be used with a modified version of the circuit shown in FIG. **14**. In this arrangement, the lower plane **1404** of the top sensor is also the top plane **1404** of the lower sensor. Under the application of a force, conduction occurs through the central layers **1105** and **1103** of both sensors, through the common plane **1104**. A potential developed at plane **1104** may be measured by a single connection made to it, and from this potential, the voltages sustained across the central layers **1103** and **1105** may be independently identified. Voltages sustained as a result of current flow across the top plane **1106**, to determine x position, and lower plane **1102**, to determine y position, may be made in the manner previously described for a constant current measuring system in a single sensor. An implementation of this arrangement requires only an additional differential amplifier and connection to the multiplexer **1407**. Thus, additional layers can be used with minimum complexity of additional control circuitry.

What is claimed is:

1. A method of detecting the position of a mechanical interaction in a sensor constructed from fabric, wherein a substantially constant electric current is established through said elements, said method comprising:

measuring a first electrical potential developed in a first plane in response to said current;

measuring a second electrical potential developed in a second plane in response to said current;

processing said measurements to identify a position of said mechanical interaction, and

connecting a calibration circuit that provides an alternative route for current flow through said first plane and through said second plane.

2. A method as in claim **1**, further including:

measuring a third potential developed between said first plane and said second plane; and

processing said third potential to identify an additional characteristic of said mechanical interaction.